Notes on Marine Algae of New Zealand. I.

VICTOR W. LINDAUER[1]

AS WOULD BE EXPECTED, considering its geographical position, New Zealand has always attracted the attention of the scientific collector, and it may, therefore, seem strange that certain conspicuous marine algae have hitherto escaped critical examination and, in some cases, have been overlooked entirely. This series of papers will deal with such, together with occasional notes on the New Zealand algal flora generally.

Family PHAEOPHYCEAE

Ectocarpus bracchiolus sp. nov.

Fig. 1*d–i.*

Frondibus minutis, 4 mm. altis, epiphyticis, orientibus e massa densa filorum serpentium; thallis tortuosis, eandem latitudinem semper servantibus, 15–24 μ latis, cacuminibus obtusis, articulis 1–4–plo latioribus, ramis raris, secundatis vel irregularibus, longis, saepius simplicibus, divaricatis, subapicaliter crescentibus, chromatophoris patinae similibus, nullis capillis; sporangia unilocularia non visa; sporangiis pluriloculariibus (1) terminalibus, erectis, 51–62 μ longis, 34–45 μ latis, positis in pedicellis 0.5 mm. altis e cellulis 12 vel pluribus constantibus; (2) lateralibus, sessilibus vel cum pedicellis unicellularibus, 62–72 μ longis, 48 μ latis, saepius ad fila ad angulos rectos vergentibus.

Fronds minute, 4 mm. high, epiphytic, arising from a dense mass of creeping filaments; thalli tortuous, of same width throughout, 15–24 μ wide, tips obtuse, articulations 1–4 times width, branches sparse, secund or irregular, long, mostly simple, divaricating, growth subapical, chromatophores plate-like, hairs absent; unilocular sporangia not seen; plurilocular sporangia (1) terminal, erect, ovoid-acuminate, 51–62 μ long and 34–45 μ wide, on pedicels 0.5 mm. high of 12 or more cells; (2) lateral, oval to ovoid, often bifurcate, sessile or with pedicels of 1 cell, 62–72 μ long and 48 μ wide, most often at right angles to the filament.

E. bracchiolus has affinities with *E. rhodochortonoides* Boerg. but the dimensions of its cells and the shape and position of its plurilocular sporangia are different. On the other hand, the sporangia more closely resemble, but are not identical with, those of *E. breviarticulatus* J. Ag., being both shortly stalked and inserted at right angles, but the vegetative thallus shows important differences. In this connection it approaches more closely *E. variabilis* Vickers in which the cells are much shorter and of nearly the same length throughout.

Distribution: On *Cladophora colensoi,* in pools, covering part of the filament with a low, soft, yellowish, hairy fringe. Pegasus, Stewart Island, the type locality; in the early autumn.

Type specimen, No. 9975, Herbarium Lindauer.

Sphacelaria stewartensis sp. nov.

Fig. 1*a–c.*

Frondibus parvis, cristatis, epiphyticis, 4–5 mm. altis, orientibus e dense aggregatis intrudentibus filis, axibus primariis thallorum percurrentibus, 30–42 μ latis, cum paucis rhizoidibus descendentibus, axe mox subraro egerente pinnas longas, simplices vel sparse ramosas, 15–24 μ latas, axi primario similes, cacuminibus obtusis sed numquam conspicuis, interdum subattenuatis; articulis saepius longioribus quam latioribus, parte superiore paris cuiusque cellularum maiore quam parte inferiore et pericys-

[1] Senior Research Fellow in the University of New Zealand at Auckland. Manuscript received March 29, 1949.

to distincto praedita, sectionibus longitudinalibus 1–3, sectionibus transversis saepe nullis, interdum singulis, numquam pluribus; capillis nullis; sporangiis unilocularibus 39–45 μ longis, 21–24 μ latis, numerosis, ovatis, saepius ternis vel quaternis in ramulis sympodialibus qui in seriebus irregularibus secundatis vel alternatis per maiorem partem thalli gignuntur; sporangia plurilocularia non visa; propagula non visa.

Fronds small, tufted, epiphytic, 4–5 mm. high, arising from closely packed penetrating filaments, main axes of thalli percurrent, 30–42 μ wide with but few descending rhizoids, axis soon giving off somewhat sparingly, long, simple or sparsely branched pinnae 15–24 μ wide similar to the main axis, tips obtuse but never conspicuous, sometimes somewhat attenuated; articulations usually longer than wide, the upper of each pair of cells larger than the lower and provided with a distinct pericyst, longitudinal divisions 1–3, transverse divisions usually wanting or one at the most; hairs lacking; unilocular sporangia 39–45 μ long, 21–24 μ wide, plentiful, oval, generally in threes or fours on sympodial branchlets which appear in irregular secund or alternate series over most of the thallus; plurilocular sporangia not seen; propagula not seen.

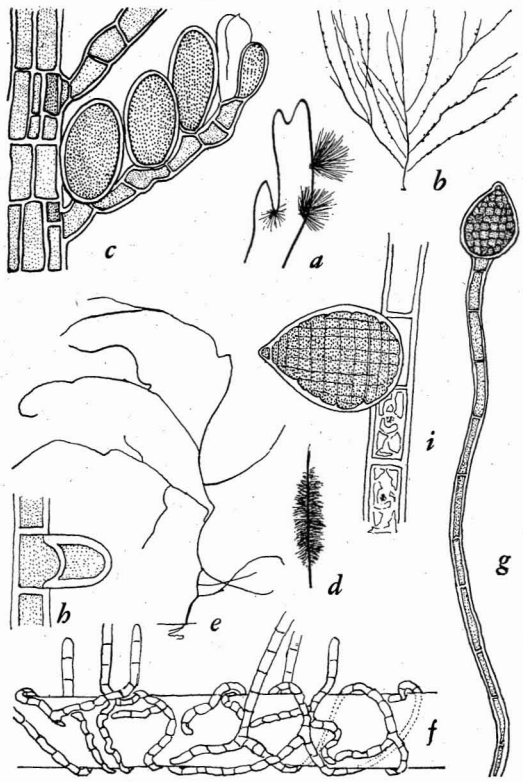

FIG. 1. Species of *Sphacelaria* and *Ectocarpus*. *a–c, Sphacelaria stewartensis* sp. nov.: *a,* in position on host (× 1.5); *b,* habit sketch (× 5); *c,* unilocular sporangial sympodium (× 330). *d–i, Ectocarpus bracchiolus*: *d,* in position on host (× 1)); *e,* habit sketch (× 15); *f,* creeping basal filaments on host; *g,* erect filament with plurilocular sporangium (× 166); *h,* initial of plurilocular sporangium (× 330); *i,* mature plurilocular sporangium (lateral) (× 330).

The plant is epiphytic on the upper segments of *Xiphophora chondrophylla,* forming small, isolated tufts, which, when removed, leave small cavities in the surface of the host. The branches are long and straggly, the lowest generally longest.

This species is closest to *S. reinkei* Sauv., of Tasmania, which plant is epiphytic on *Cystophora;* but dimensions of the new species are smaller, its branching is pinnate and not appearing dichotomous; it has no hairs, no felted basal portion, and the number of transverse divisions of the articulations is fewer.

It also resembles *S. sympodicarpa* Sauv., of Europe, but is larger and has no creeping filaments; *S. chorizocarpa* Sauv., of Australia, but is lacking in hairs and plurilocular sporangia; *S. borneti* Reinke, but again has no plurilocular sporangia. Sauvageau, however, considers *S. borneti* to be identical with *S. reinkei* Sauv.

Distribution: Epiphytic on *Xiphophora chondrophylla* at Twilight Bay, Pegasus, Stewart Island, the type locality; most abundant in March.

Type specimen, No. 9955, Herbarium Lindauer; iso-types distributed in Lindauer (1948), *Algae Nova-Zelandicae Exsiccatae,* Fasc. XIII, No. 311.

Spatoglossum chapmanii sp. nov.

Fig. 2*a–f.*

Fronde erecta, complanata, ecostata, subpalmata, dichotoma, haud concentrice striata, ad 80 cm. alta, membranosa vel cortacea, subglauca

vel fusco-oleaginia; haustorio stuposo; stipite brevi, stuposo, mox in laminam latam cuneatim patente, terminaliter diviso in numerosa longa vel subdichotomopalmata segmenta cuneos latos simulantia; sinubus rotundatis, rursus terminaliter divisis in lata linearia vel lingulata segmenta; apicibus rotundatis; marginibus intergris vel perraro dentatis; sporis in series plus minusve longitudinales sparsis.

Frond erect, flat, ecostate, subpalmate-dichotomous, not concentrically striate, up to 80 cm. high, membranous to coriaceous, greenish-olive to dark olive-brown, holdfast stupose, stipe short, stupose, soon expanding cuneately into a wide blade, splitting terminally into numerous long, palmate or subdichotomous-palmate broadly cuneate segments, sinuses rounded, dividing again into terminal broadly linear or lingulate segments, apices rounded, margins entire or very sparsely toothed; sporangia scattered or in more or less longitudinal bands.

Named in honour of Professor V. J. Chapman, of Auckland University College, New Zealand, whose assistance and friendship over a period of many years have been greatly valued.

The plants are probably dioecious, but the oögonia have not been definitely recognized. The antheridia are clustered into protruding, elongated, arched sori, up to 210 μ wide and 60–75 μ high, containing small, cuboidal loculi. The sporangia, each forming a quadrant of spores, are large, protruding, broadly pyriform or clavate, with very dark content and thick walls, solitary or closely scattered into somewhat longitudinal lines, 84–108 μ high and 75–105 μ wide, on stalks of 1–2 cells, the latter not always clearly visible. Structure of from 2–3 layers of large, colorless medullary cells, bounded by one row of smaller subcortical cells and one cortical layer of cuboidal photosynthetic cells in width equal to, or half that of, the subcortical cell immediately below.

There appear to be two very distinct ecological forms of this plant: the one greenish, membranous, broad, flabellate; the other brown, subcoriaceous, narrow, dichotomous. The former

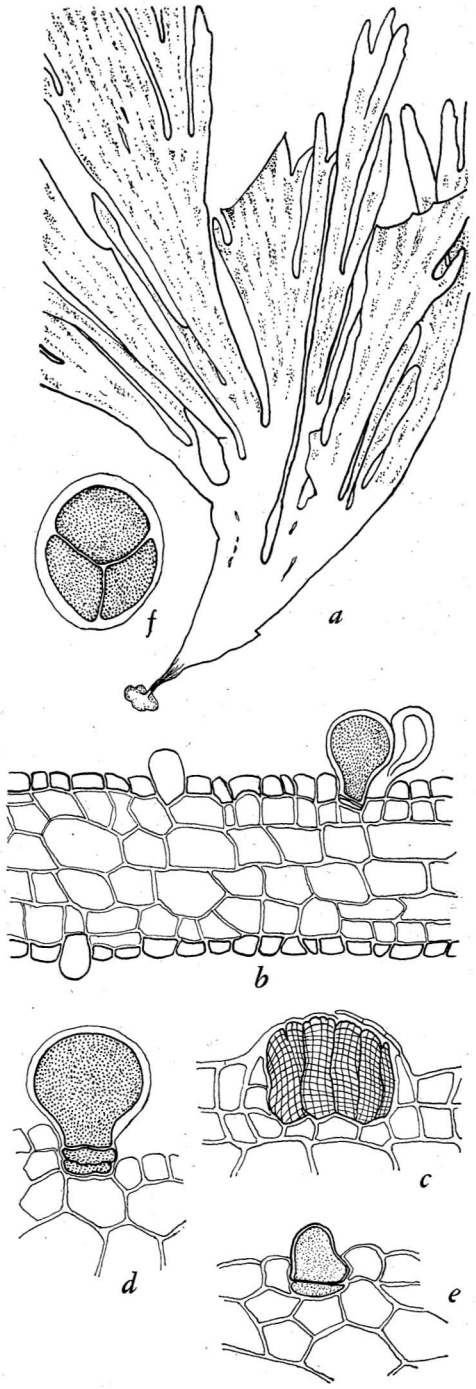

FIG. 2. *Spatoglossum chapmanii* sp. nov.: *a,* habit sketch (× 0.2); *b,* transverse section of frond; *c,* antheridial sorus in transverse section; *d,* tetrasporangium in transverse section; *e,* initial of tetrasporangium in transverse section; *f,* tetrasporangium, surface view.

grows in comparatively still, sheltered situations, and small plants of this form closely resemble *Taonia,* from which they differ macroscopically, in the lack of transverse, concentric bands. The latter is the commoner form.

In structure the plant agrees most closely with *S. solierii* (Chauv.) Kuetz., from the Mediterranean, as distributed by Schiffner, *Algae Marinae,* No. 689, but in vegetative habit is closer to *S. cornigerum* J. Ag. of Australia; but no exact comparison can be made until the Australian plant is more extensively collected.

Distribution: In the upper sub-littoral and extending downwards, often hanging from rock just below low-water line or growing on rocks on the bottom. Found more or less abundantly from Whangarei to the Bay of Plenty, Wellington, Bluff, Stewart Island (type locality). Spring and summer.

Type specimen No. 6702, Herbarium Lindauer; iso-types distributed in Lindauer (1946), *Algae Nova-Zelandicae Exsiccatae,* No. 209.

Myrionema compactum sp. nov.

Fig. 3*a–e.*

Thallo epiphytico, pulvinum parvum tenuem glaucum lineamentis irregularibus formante, coniuncto ad nodos et internodos superiores Hormosirae banksii var. gracilis; strato basali prostrato monostromatico, constante e filis plus minusve tortuosis, dense adpressis, 9–12 μ diametro, subdichotome ramosis praesertim prope marginem; filis erectis 6–12 cellularum, brevibus, latis, cylindricis, obtusis, 54–100 μ altis, 15–21 μ latis, interdum duobus filis erectis ex eadem cellula basali orientibus; unilocularibus sporangiis sessilibus, rarius breviter pedicellatis, directe e strato librato orientibus aut rarius lateraliter e parte superiore filorum erectorum, late clavatis vel cylindricis, 40–80 μ altis, 15–27 μ latis, irregulariter per frondem sparsis; plurilocularibus sporangiis ad 12 ordines loculorum altis, in pedicellis 1–5 cellularum positis, seriebus e 2–4 constantibus, 60–99 μ altis, 15–18 μ latis, parietibus transversis libratis; capillis 9 μ latis; chromatophoris parvis, disciformibus.

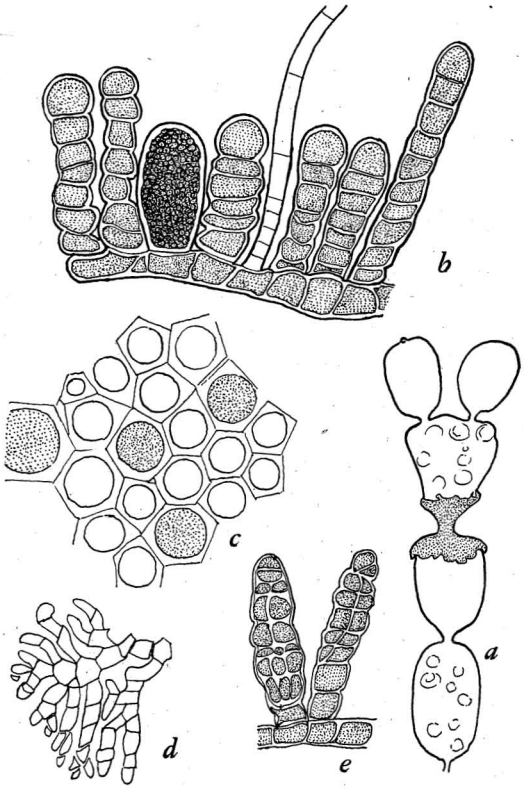

FIG. 3. *Myrionema compactum* sp. nov.: *a,* colony on host (× 2); *b,* erect filaments and unilocular sporangium (× 325); *c,* surface view showing erect filaments, sporangia (shaded), and a hair (× 325); *d,* tip of prostrate filament (× 200); *e,* plurilocular sporangia (× 300).

Thallus epiphytic, forming a small, thin, dull-grey, skin-like cushion irregular in outline, attached to the upper nodes and internodes of *Hormosira banksii* var. *gracilis;* prostrate basal layer monostromatic, composed of more or less tortuous, closely adpressed filaments 9–12 μ in diameter, subdichotomously branched, especially towards the periphery; erect filaments of 6–12 cells, short, broad, cylindrical, obtuse, 54–100 μ high and 15–21 μ broad, sometimes 2 erect filaments arising from the same basal cell; unilocular sporangia sessile, more rarely shortly pedicelled, arising directly from the horizontal stratum or, more rarely, laterally from the upper

part of the erect filaments, broadly clavate or cylindrical, 40–80 μ high and 15–27 μ wide, scattered irregularly over the frond; plurilocular sporangia up to 12 tiers of loculi in height, on pedicels of 1–5 cells, 2–4-seriate, 60–99 μ high and 15–18 μ wide, cross walls horizontal; hairs 9 μ wide; chomatophores small, disciform.

In its typical form the filaments are short and squat, but they vary a great deal in different areas of the colony, becoming longer and more slender. Unilocular and plurilocular sporangia are scattered promiscuously among the erect filaments or, in the case of the latter, taking their place in the course of the maturation of the filaments. As the colony matures the host seems to shed its cuticle to which the *Myrionema* remains attached, and the whole peels off naturally in due course. Dark-colored cells of homogeneous content are present, and resemble unilocular sporangia in size and shape and are, perhaps, merely degenerate sporangia.

The species under discussion is closest to *M. primarium* Setch. et Gard. (=*M. foecundum* f. *majus* S. et G.), from which it differs in its very much more massive proportions, especially as to width of erect filaments, hairs, and plurilocular sporangia, and in the number of loculi.

Growing on *Hormosira banksii* var. *gracilis* in tide-pools in the upper littoral.

Distribution: Known only from the type locality, Long Beach, Russell, Bay of Islands.

Type specimen, Lindauer, No. 11306 (formalin material), deposited in the Herbarium of Auckland University College.

Genus **Herponema** J. Ag.

On reading Agardh's (1882: 55) diagnosis of his new genus, *Herponema,* it becomes apparent that the characters emphasized by him are vague and have been the cause of much confusion in New Zealand, where two species of the genus supposedly existed. The following is a translation of the diagnosis:

Herponema J.Ag. mscr. — Frond flat-cushioned or subglobose, not particularly gelatinous, made up of a double layer: *axis* primarily decumbent, and forming along the periphery of a centrifugally rising cushion rather simple or sparsely branched filaments radiating from the center and attached below, then forming a hypothallic layer at times barely distinguishable; *peripheral* layer consisting of rising filaments, then of filaments erect, very dense, cylindrical, articulate, thickish, stiff, all of similar shape; single sporangia terminal in the simple peripheral filaments, or lateral on the modified branchlets, hollow where the apex is broken.

Agardh included three species in *Herponema: H. pulvinatum, H. velutinum,* and *H. maculans,* which the writer proposes to discuss in turn.

Herponema pulvinatum J.Ag.

Agardh described the species from a specimen sent to him by Harvey under the herbarium name of *Ectocarpus pulvinatus.* The species was, however, never described by Harvey as such, but it is here suggested that Harvey described it at an earlier date (1855: 221) as *Sphacelaria pulvinata,* which name the plant still bears. It is unfortunate that Harvey's material is not available for comparison, but an analysis of the descriptions of *Herponema pulvinatum* and *Sphacelaria pulvinata* shows that the two plants are identical in all major details; furthermore, the habit and the host plant of both are the same. It is noteworthy that de-Toni (1895: 397 and 508) gives *Ectocarpus pulvinatus* Harv. as the synonym for both *Herponema pulvinata* and *Sphacelaria pulvinata.* Furthermore, the writer has collected a plant which answers to the description of *Sphacelaria pulvinata* Harv. and found it actually to be a species of *Sphacelaria,* and has distributed that plant in his *Algae Nova-Zelandicae Exsiccatae* (1942), No. 131.

Herponema velutinum (Grev.) J.Ag.

H. velutinum (Grev.) J.Ag.=*Sphacelaria ? velutina* Grev.=*Elachista velutina* (Grev.) Fries=*Ectocarpus velutinus* Kuetz.=*Streblonema ? velutinum* (Grev.) Thur., *vide* de-Toni (1895: 578).

This plant belongs to a group of parasitic species possessing vertical basal penetrating

filaments instead of a basal layer of horizontal filaments. Hamel (1931–39: XII), however, by implication designated it as the type species of *Herponema.* The writer, on the other hand, is of the opinion that although J.Agardh listed *H. pulvinata* and *H. velutina* before describing *H. maculans,* his description of the genus is essentially based on the latter species. The description fits it far better than it does either of the others, and the three diagrams (Tab. III, Figs. 4a, b, and c) are illustrations of that plant alone. It therefore seems more logical to regard *H. maculans* as type of the genus, especially since J.Agardh in his generic diagnosis points out that the plants possess two types of filaments, (1) horizontal and (2) erect; and since neither *H. pulvinata* nor *H. velutina* has a distinct basal system of horizontal filaments they cannot possibly be regarded as typical of the genus, or, in fact, as members of it. On the other hand most authors have placed the species *velutina* in *Ectocarpus.* In fact, the plant might well remain there until a more careful study has been made of the genera concerned, namely, *Ectocarpus, Herponema, Compsonema,* and *Hecatonema.*

Herponema maculaeforme (J.Ag.) Laing
Fig. 4*a–j.*

H. maculaeforme (J.Ag.) Lg. (orthog. mut.)=*H. maculans* J.Ag.=*Elachista maculaeformis* J.Ag.=*Herponema maculaeformis* (J.Ag.) Lg. (Note: J. Agardh had originally used the specific epithet *maculaeformis* but, by some oversight, he renamed the species *maculans* when transferring it to his new genus, *Herponema.* Laing (1929: 579) rectified the error but neglected to alter the gender of the termination, which has here been done.)

The identity of *Herponema maculaeforme* has for many years evaded New Zealand algologists. It had originally been described by J. Agardh (1877: 4) as *Elachista maculaeformis* but in 1882 (p. 56), he renamed it *Herponema maculans.* The plant does not, therefore, appear in Hooker's *Handbook* (1867), which was for many years the only book of reference to the New Zealand algae possessed by local workers. In due course Kjellman (1891–93: 187) reduced the genus to *Ectocarpus,* as had also been

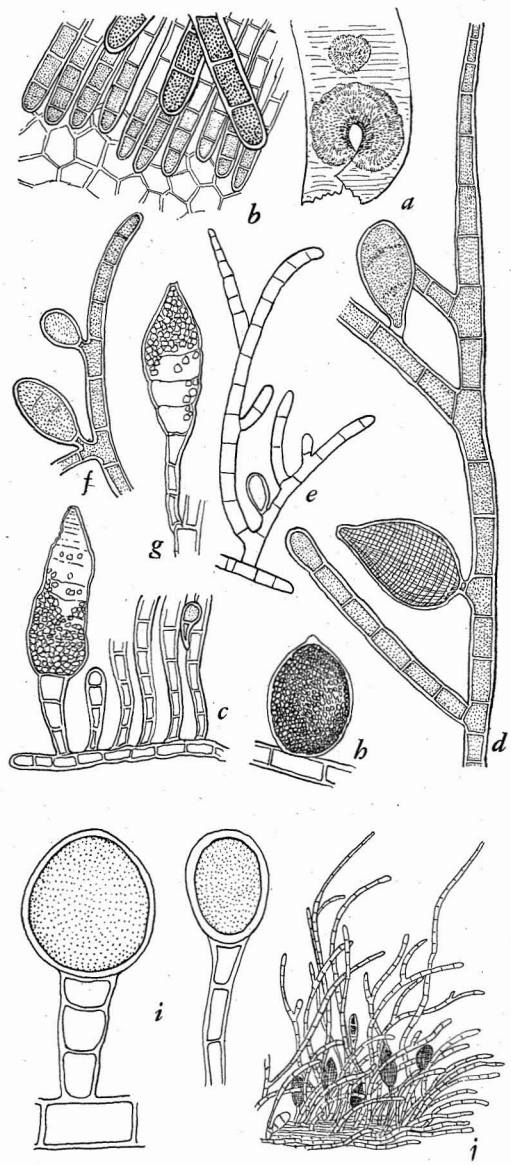

FIG. 4. *Herponema maculaeforme* (J.Ag.) Laing: *a,* colony on host (× 2); *b,* basal rhizoids with tips of three erect filaments for comparison (× 150); *c,* rhizoid with erect filaments (× 150); *d,* erect filament, somewhat straightened, with sporangia (× 150); *e,* small plant (× 130); *f,* tip of filament (× 150); *g, h,* old plurilocular sporangia (× 150); *i,* unilocular sporangia (× 150); *j,* showing basal, rising, and erect filaments, and sporangia (× 20).

done by Hauck (1885: 324–326); but much later Laing (1926: 138), and Lindauer (1947: 544–545), still included both *Herponema maculaeformis* and *H. pulvinata* in their lists.

As the description given by Agardh is rather vague and incomplete, a more detailed description is here given.

Thalli forming small, low, soft, furry, circular or confluent mats up to 1.5 cm. in diameter on the upper segments of *Xiphophora chondrophylla,* black when submerged, brown when dry, colonies consisting of a prostrate basal system of horizontal, closely adpressed, radiating filaments, 15 μ wide, and an erect system of slightly broader filaments, about 1 mm. high and 21–24 μ wide, tapering slightly downwards, arcuate, sparsely and irregularly divaricatingly branched, the branches most frequently arising on the convex side of the bent rachis and of the same width; tips obtuse, swollen or attenuated into a hair; articulations about 2–3 times as long as wide; protoplast of a dense golden-brown, granulated, with chromatophores closely packed, rod-like; unilocular sporangia globose or ovate, about 42–60 μ high and 45 μ wide, pedicellate on the prostrate filaments; plurilocular sporangia very numerous, irregular in size and shape, ovate, ovate-acuminate or siliquose, up to 150 μ high and 66 μ wide, pedicellate or sessile, terminal or lateral; loculi pluriseriate.

The height of the filaments varies a great deal according to their position in the colony. The plurilocular sporangia, recorded here for the first time, are excessively abundant and sometimes resemble the unilocular sporangia to such an extent that it is very difficult to distinguish between them; plurilocular sporangia of this type are, however, generally sessile and lateral on the branches, whereas the unilocular sporangia are usually pedicellate on the basal horizontal stratum.

Distribution: This plant is found from Wellington southwards, becoming very abundant on Stewart Island in April and May, otherwise appearing sporadically and sparsely throughout the year.

Distributed in Lindauer (1946), *Algae Nova-Zelandicae Exsiccatae,* No. 229, as *Hecatonema?*

It will be seen from the above description that the plant, *H. maculaeforme,* which alone remains of the triumvirate of J. Agardh's species, could seemingly be placed in Kuckuck's genus, *Compsonema* and, vague as Agardh's diagnosis of *Herponema* may be, it certainly appears to coincide with the description of what is understood as *Compsonema* in its broad sense, or with a group of algae which might embrace *Compsonema.* The generic epithet *Herponema* (1872) antedates *Compsonema* (1899); furthermore, Kuckuck's genus was built around a species which is still unique in the possession of but one chromatophore (*vide* Feldmann: 1937: 119) in each cell together with a conspicuously stratified filament producing endogenous hairs. Should *Compsonema* be accepted in this narrow sense it is plain that at least some of the Setchell and Gardner species attributed to *Compsonema* do not belong there, but should, perhaps, be included in the older genus, *Herponema,* and it is possible that some species of *Hecatonema* would be more properly attributed to *Herponema,* or that the former genus might be entirely absorbed by the latter.

Hapalospongidion durvilleae sp. nov.

Fig. 5*e–i.*

Thallis parasiticis, erectis, pannos humiles ellipticos in *Durvillea antarctica* formantibus, filamentis artis, paene ecoloribus, 525–600 μ altis, 11.25 μ latis, filamentis singulis constantibus e cellulis ad 15, cellulis 3–6-cies longioribus quam latioribus; sporangiis unilocularibus ellipsoidis, 71 μ altis, 22.5 μ latis, terminalibus in brevibus erectis filamentis.

Thalli parasitic, erect, forming low, ellipsoidal patches on *Durvillea antarctica;* filaments simple, narrow, almost colorless, 525–600 μ high and 11.25 μ wide, each filament consisting of up to 15 cells, cells 3–6 times as long as wide; unilocular sporangia ellipsoidal, 71 μ long and 22.5 μ wide, terminal on short erect filaments. The nature of the basal system of penetrating

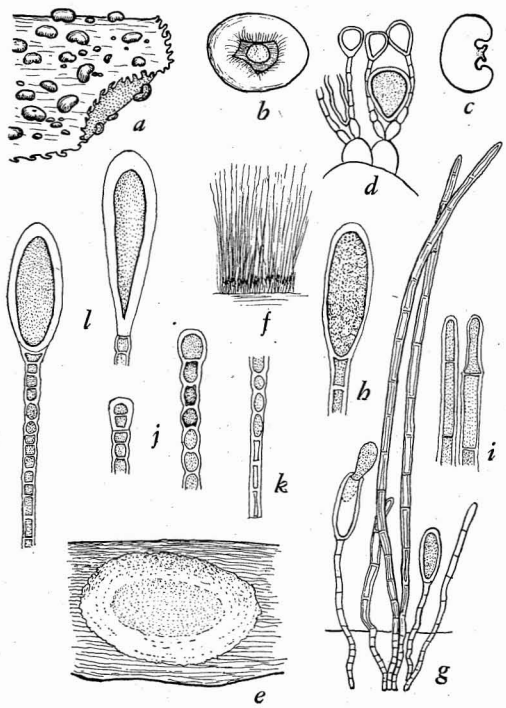

FIG. 5. Species of *Leathesia* and *Hapalospongidion*. *a–d, Leathesia novae-zelandiae* sp. nov.: *a,* colonies on host (× 0.5); *b,* undersurface (× 2); *c,* vertical cut through long axis of smaller specimen (× 2); *d,* paraphyses and sporangia (one dehisced) (× 140). *e–i, Hapalospongidion durvilleae* sp. nov.: *e,* on host (× 0.5); *f,* habit sketch (× 35); *g,* filament with penetrating rhizoids and sporangia (one injured) (× 150); *h,* a sporangium (× 280); *i,* tips of filaments (× 266). *j–l, Hapalospongidion saxigenum* sp. nov.: *j,* tips of filaments (× 166); *k,* base of filament (× 166); *l,* unilocular sporangia (× 170).

filaments has not yet been satisfactorily determined.

The plants form small, oval patches at first, but later these become confluent and cover large areas within the margins of the blade of the host, not only on one surface of the blade but also on the opposite surface, the colony assuming exactly the same size and shape of that on the opposing surface, as if the parasite had grown right through the thallus of its host. The color, *en masse,* is dark brown and velvety but, on drying, it becomes yellowish-sienna and is very conspicuous on the dark, almost black frond of the dry *Durvillea.* The protoplast is very light straw-colored, almost colorless under the microscope, but the sporangia are somewhat darker and very numerous in a low line among the long, erect filaments. This lack of color of the protoplast is in accordance with the plant's parasitic state. The chromatophores are small, disc-shaped, sparse, except at the tips.

This species may prove to belong to a new genus but in the meantime, until the plant is cultured, it is as well to place it here tentatively.

Distribution: So far known only from Stewart Island, the type locality, where it is abundant in autumn and winter.

Type specimen No. 6253, Herbarium Lindauer; iso-types were distributed in Lindauer (1946), *Algae Nova-Zelandicae Exsiccatae,* No. 230, as *Herponema?*

Hapalospongidion saxigenum sp. nov.

Fig. 5*j–l.*

Thallis minutis, erectis, aggregatis, fulvis, lubricis; filis simplicibus, arcte clavatis, 225–725 μ altis, 6–18 μ latis, constantibus e cellulis ad 60, cacuminibus obtusis, cellulis vix longioribus quam latioribus, paene tumido-cylindricis vel moniliformibus, cellulis basalibus aliquanto arctioribus, orthogoniis, ecoloribus, 2-plo longioribus quam latioribus; chromatophoris minutis, disciformibus; unilocularibus sporangiis grandibus, terminalibus, ovatis vel clavatis, 105–170 μ altis, 36–45 μ latis, parietibus cellularum conspicue crassis, pedicello constante e 12 vel pluribus cellulis, superne 12 μ latis, infra 4–6 μ latis; sporangia plurilocularia non cognita.

Thalli minute, erect, gregarious, dull yellowish-brown, lubricous; filaments simple, narrowly clavate, 225–725 μ high and 6–18 μ wide, consisting of up to 60 cells, tips obtuse, cells scarcely longer than wide, somewhat barrel-shaped or moniliform, basal cells somewhat narrower, rectangular, colorless, twice as long as wide; chromatophores minute, disciform; unilocular sporangia large, terminal, oval or clavate, 105–170 μ high and 36–45 μ wide, with conspicuously thick cell walls, pedicel of 12 or more cells 12 μ wide above and 4–6 μ wide below;

plurilocular sporangia unknown. The basal distromatic or tristromatic layer characteristic of the genus is barely distinguishable in this species, but it appears to exist.

The new species is closely related to *H. gelatinosum* Saunders in habit and stature but differs principally in the absence of plurilocular bodies, and in the poorly developed basal layer. It also has affinities with *H. pangoensis* (Setch.) Hollenbg. which is, however, smaller in its dimensions.

Forming low, slippery, continuous, suede-like patches mostly of large size on smooth boulders, somewhat resembling *Ralfsia,* but not crusty. On removal from rocks it becomes a pulpy, gelatinous mass. Small fragments on the microscope slide press out, under the cover slip, into circular tufts of radiating filaments with the bases closely adpressed in the center.

Distribution: In the intertidal region in the more exposed situations probably throughout New Zealand. Definitely known from Russell, Pihama (Taranaki), Kaikoura, Stewart Island (the type locality). Mostly summer and autumn.

Type specimen No. 11320, Herbarium Lindauer, deposited in the Herbarium of Auckland University College.

Leathesia novae-zelandiae sp. nov.

Fig. 5*a–d.*

Frondibus epiphyticis, fusco-oleaginis, glabris, solidis, hemisphaericis, ad 7 mm. diametro, 4 mm. altis, filamenta e 5–9 cellulis assimilantibus, clavatis, cellula terminali obovoida; sporangiis unilocularibus obovoidis, 71–90 μ longis, 34–45 μ latis.

Fronds epiphytic, olive-brown, glabrous, solid, hemispherical, up to 7 mm. in diameter and 4 mm. high, assimilating filaments of 5–9 cells, clavate, the terminal cell obovoid; unilocular sporangia obovoid, 71–90 μ long and 34–45 μ wide.

The juvenile frond arises from a prostrate basal system of radial, compact, branched filaments, and may readily be mistaken for *Myrionema.* The periphery of the mature thallus is oval, circular, or slightly irregular in outline, convolutions on the surface are wanting, but a dimple sometimes develops in the center of the rounded upper surface. The under surface is concave even in specimens of 1 mm. in diameter and less, so that the detached thallus resembles the "cap" of a mushroom. The attachment appears in the center of the concavity as a slightly raised dark brown patch, 1.5–2 mm. in diameter in the largest specimens; this may be distinctly seen from the reverse side of the frond of the host plant if held to the light.

This plant is distinct from any other species of the genus known to the author.

Distribution: Epiphytic on both surfaces of the fronds of *Gigartina lanceata* and, possibly, on other foliose species of the genus, occupying the spaces between the superficial lingulae, if present. Sublittoral along the shores of Stewart Island, the type locality. Common at midsummer.

Type specimen No. 8132, Herbarium Lindauer; iso-types distributed in Lindauer (1947), *Algae Nova-Zelandicae Exsiccatae,* Fasc. XI, No. 256.

Durvillea willana sp. nov.

Fig. 6

Frondibus 5 m. vel ultra longis, fuscis, coriaceis; disco scutato; stipite crasso, cylindrico, 1 m. longo, planius et latius crescente in latam complanatam laminam in segmenta loris similia plus minusve alte divisam; stipite ferente multas proliferationes irregulariter positas in omnibus longitudinis partibus, proliferationibus singulis efformatis e stipite, lamina, segmentis axem principarium simulantibus, interdum in margine positis in superiore complanata parte stipitis primarii.

Frond 5 m. or more long, dark brown, leathery, attachment a thick, scutate disc, stipe stout, cylindrical, 1 m. or more long, flattening and widening upwards into a broad complanate blade split more or less deeply into strap-like segments; stipe bearing many proliferations placed irregularly on all sides throughout its length, each consisting of a stalk, blade, and

segments similar to the main axis, proliferations sometimes becoming marginal on the upper, flattened portion of the stipe.

The plant somewhat resembles *Sarcophycus potatorum,* differing from it mainly in the presence of secondary branches, produced often in

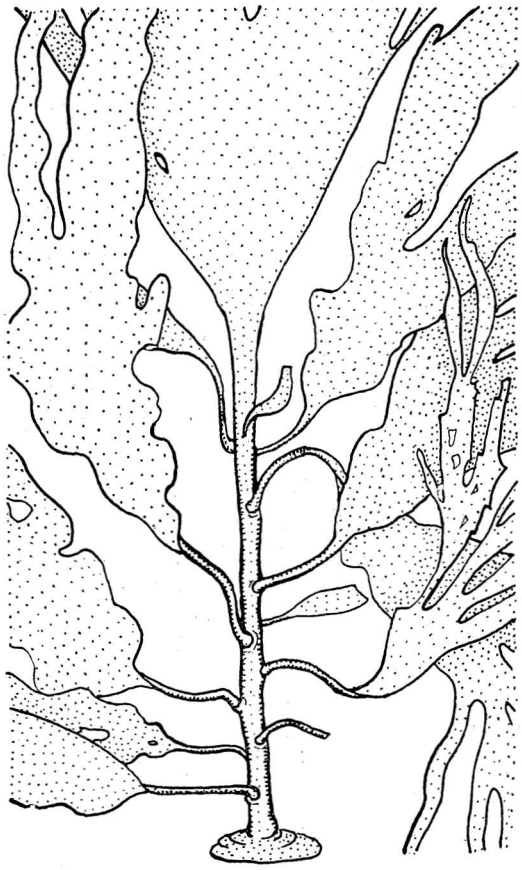

FIG. 6. *Durvillea willana* sp. nov.: habit sketch (× 0.08).

large numbers, sometimes 40 or more, from the main stipe. It differs from *Durvillea antarctica,* not only in its proliferated stipe, but in the absence of an internal layer of large, empty, colorless, columnar, polygonal chambers, which make the blade cushion-like to the feel, agreeing in that respect with *D. harveyi* of the Cape Horn region and *Sarcophycus potatorum* of Tasmania and Australia.

At low water, instead of sprawling on or hanging from the rocks, as is the habit of *D. antarctica,* the stipe of the new species stands erect with the blade drooping from its extremity. Hence the two species may readily be distinguished at a distance.

Distribution: Generally fringing rocks over a clean, sandy bottom in comparatively shallow water; missing where clean sand is absent; often growing with *D. antarctica* in suitable situations, but generally on the seaward side of it on a gently shelving bottom, and never with it over deep water. Common at Taylor's Mistake (Christchurch), Timaru, and south to Stewart Island; N. W. Nelson Province.

Named in honor of Mrs. Eileen Willa of Half Moon Bay, Stewart Island, whose tireless enthusiasm and intensive collecting have greatly assisted the author in his work.

Carpophyllum plumosum var. **quercifolium** var. nov.
Fig. 7*d–e.*

Frondibus erectis, ad 90 cm. altis, distichis; rachidibus complanatis, sinuosis, ramulis marginaliter et sat distanter etrudentibus, habitum speciei retinentibus; laminis basalibus querciformis, 5 cm. longis, cacuminibus obtusis, lobis obtusis; laminis medialibus arctioribus, lobis ornatis, acutis; laminis terminalibus simplicibus, parvis, infra attenuatis; vesiculis parvis, ellipsoidis, pedicellularibus; receptaculis paniculatis.

Frond erect, up to 90 cm. high, distichous, complanate, sinuous, the branches emerging marginally and somewhat distantly, in general habit resembling the original species; basal "leaves" oak-shaped, 5 cm. long with obtuse tips and blunt lobes; medial narrower, lobed, acute; terminal simple, small, attenuate below; vesicles small, ellipsoidal, pedicelled; receptacles panicled.

Distribution: In the sublittoral fringe at Chatham Islands, the type locality.

Type specimen No. 2480, Herbarium Lindauer.

Family RHODOPHYCEAE

Gigartina pachymenioides sp. nov.

Fig. 7*a–c.*

Frondibus erectis, fusco-rubris, complanatis, sub-cartilaginosis, ad 20 cm. altis; basi incrustata; stipite 1 cm. long, terete, paulatim patente in magis minusve certam "apophysim" ad 3 cm. longam, 1 cm. latam; lamina simplici, linearilanceolata vel flabellata, plurimis furcis diversis; basi laminae cuneata vel obtuso-rotundata ad 6 cm. lata; apicibus attenuatis; margine sinuoso, crenulato, subtiliter undulato vel minutis obtusis processibus ornato; superficie frondis tetrasporicae levi, e cystocarpio constante, sparse vel dense operta brevibus lingulis vel proliferationibus volutis simplicibus aut ramosis linearibus; cystocarpiis globosis, positis in marginalibus vel superficialibus papillis, ostiolatis, tetrasporangiis in soris in serie subcorticali sparsis, cruciatis.

Fronds erect, dark red, complanate, sub-cartilaginous up to 20 cm. high, base incrusting, stipe 1 cm. long, terete, widening gradually into a more or less distinct "apophysis" up to 3 cm. long and 1 cm. wide, blade simple, linear-lanceolate or flabellate and several times divergingly forked, base of blade cuneate or broadly rounded up to 6 cm. wide, apices attenuated, margins sinuous, crenulate, finely undulate or provided with minute, blunt outgrowths; surface of tetrasporic frond smooth, of the cystocarpic covered sparsely to densely with short lingulae or coiled simple or branched linear proliferations; cystocarps globose, borne on marginal or superficial papillae, ostiolate; tetrasporangia in scattered sori in the sub-cortical layer, cruciate.

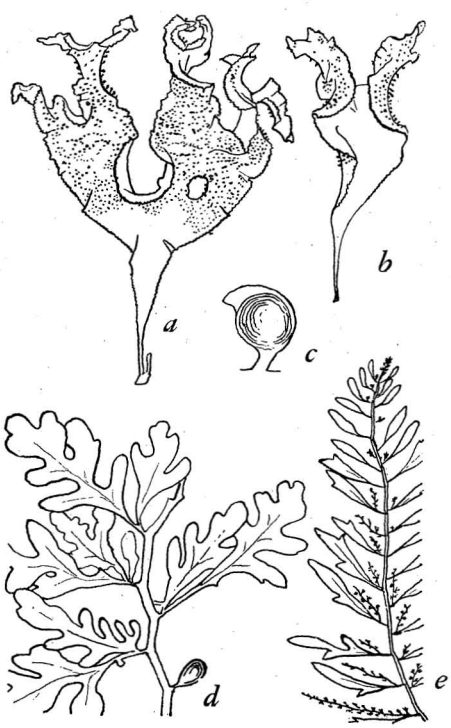

FIG. 7. Species of *Gigartina* and *Carpophyllum*. *a–c, Gigartina pachymenioides* sp. nov.: *a, b,* habit sketches (× 0.6); *c,* cystocarp (× 5). *d, e, Carpophyllum plumosum* var. *quercifolium* var. nov.: *d,* habit (× 0.6); *e,* fertile tip (× 0.6).

The form of the plant is very varied, the width and shape of the segments in particular being very irregular. There are no outgrowths from stipe or "apophysis," nor are papillae or reproductive organs present on apophysis or basal part of blade. The frond has a strong tendency to curl, so that the margins are wavy and the tips often spirally twisted. Unlike normal foliose *Gigartina,* it does not decompose quickly when exposed to rain in wrack along the shore, but remains firm and solid for a much longer period, in the manner of *Pachymenia;* hence its specific name.

No suggestions can be offered at the moment as to the probable affinities of this species in this most difficult genus. *G. pachymenioides,* beyond belonging to the foliose group of *Gigartina,* has very little in common with other local species.

Distribution: At and above low-water mark on cliff faces and rocks on Stewart Island, the type locality.

Type specimen No. 7403, Herbarium Lindauer; iso-types distributed in Lindauer (1948), *Algae Nova-Zelandicae Exsiccatae,* Fasc. XIII, No. 321.

Callithamnion levringii sp. nov.

Fig. 8*a–d.*

Fronde perdelicata, rosea, disticha, decompos-

ita, filimentosa, monosiphonia, ecorticata, ad 10 cm. alta, oriente e rhizoidibus basalibus; axe primario percurrente, flexuoso, in vicem sparse ramoso, ramis inferis longioribus, patentibus, laxis, ramulis alternis singulos ad articula singula ornatis, brevibus, fastigiatis, alterno-dichotomis; ramulis ultimis saepe secundis; articulis axis primarii 2 mm. longis, 0.3 mm. latis, ramulorum 6-cies longioribus quam latioribus, cacuminibus obtusis; cystocarpiis non observatis; sporangiis (?) obovoidis, breviter pedicillatis intra furculas ramulorum.

Frond very delicate, rose-red, distichous, decompound, filamentous, monosiphonous, ecorticate, up to 10 cm. high, arising from basal rhizoids; main axis percurrent, flexuous, sparsely alternately branched, branches longest below, patent, lax, clothed with alternate branchlets, one to each articulation, short, fastigiate, alternate-dichotomous, the ultimate ramuli often secund; articulations of main axis 2 mm. long, 0.3 mm. wide, of the ramuli 6 times as long as wide, tips obtuse; cystocarps not seen; sporangia (?) obovoid, shortly pedicillate within the forks of the ramuli.

The genus to which this plant belongs is questionable and may require revision when sexual plants are discovered. The form of the sporangium (?) is most unusual. It is first recognizable as such as the swollen and enlarged terminal cell of a lateral or axial 2-celled branch, the lower cell acting as a pedicel. At this stage it resembles a monosporangium. As it enlarges, the content is divided at the lower third, the upper larger part appearing to have been cut off from the lower part and resting in it. It now appears as an unequal bisporangium. Maturation progresses most rapidly at the distal end and soon the content is divided at the upper third. The sporangium (?) is now vaguely seirospore-like, but no further development has been observed.

In general vegetative habit the plant resembles *C. licomophorum* Harv., of Victoria, Australia, and is, perhaps, nearest to it, although

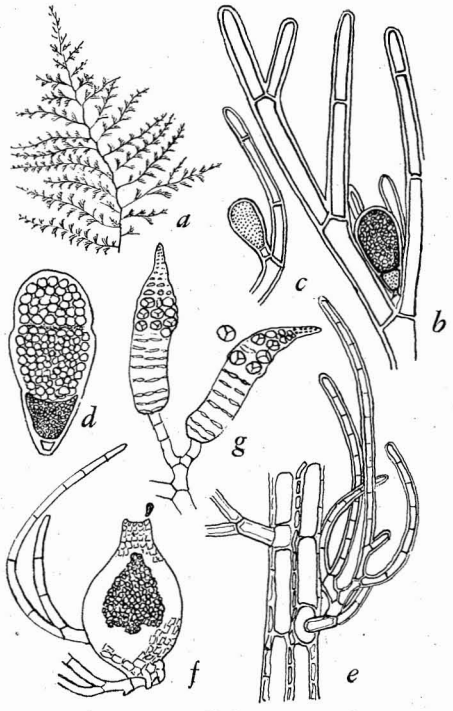

FIG. 8. Species of *Callithamnion* and *Dasya*. *a–d*, *Callithamnion levringii* sp. nov.: *a*, pinna (× 0.6); *b*, tip bearing polysporangium (× 65); *c*, young polysporangium (× 65); *d*, polysporangium almost mature (× 120). *e–g*, *Dasya subtilis* sp. nov.: *e*, portion of frond (× 120); *f*, cystocarp (× 120); *g*, tetra sporangial stichidia (× 120).

the New Zealand specimens lack rhizoids coating the main divisions and the reproductive bodies are dissimilar.

Distribution: So far found only in the drift at Pihama, Taranaki, the type locality. Summer.

Type specimen No. 7165, Herbarium Lindauer; iso-types distributed in Lindauer (1948), *Algae Nova-Zelandicae Exsiccatae,* Fasc. XIII, No. 325.

Dasya subtilis sp. nov.

Fig. 8*e–g*.

Frondibus parvis, rubescentibus, cristatis, teneris, flaccis, filiformis, 2–4 cm. altis, decompositis, in vicem subdistichose ramosis; ramis primariis corticatis, pericentricis cellulis 5; ramulis ultimis monosiphonis, dichotomis, divaricatis; articulis 3–4-cies longioribus quam latioribus, cacuminibus obtusis; ramulis terminalibus saepe aggregatis et involutis; cystocarpiis magnis, sessi-

libus in polysiphoniis basalibus segmentis lateralium, late ovoidis, ore conspicuo ornatis; tetrasporangiis positis in 2–3 regularibus seriebus in magnis fusiformis stichidiis in monosiphoniis pedicellis.

Fronds small, pink, tufted, tender and flaccid, filiform, 2–4 cm. high, decompound, alternately subdistichously branched, main branches corticate, pericentral cells 5, ultimate branchlets monosiphonous, dichotomous, divaricate, tips obtuse, articulations 3–4 times as long as wide, terminal ramuli often crowded together and incurled; cystocarps large, sessile on the polysiphonous basal segments of laterals, broadly ovoid with a prominent orifice; tetrasporangia in 2–3 regular rows in large, fusiform stichidia on monosiphonous pedicels. Summer; annual.

The plant is closely allied to *D. collabens* H. et H. but is very diminutive in size and is epiphytic upon a different type of host, as well as being restricted in range to the north of New Zealand. It is also able to withstand exposure to the atmosphere during low tides.

Distribution: On *Corallina* in the littoral region at low-water neap tide during the summer months; common at Long Beach, Russell (type locality); Auckland.

Type specimen No. 947, Herbarium Lindauer; iso-types distributed in Lindauer (1947), *Algae Nova-Zelandicae Exsiccatae,* Fasc. XII, No. 300, as *Heterosiphonia subtilis.*

ACKNOWLEDGMENTS

The writer is indebted to Professor V. J. Chapman of Auckland University College for many invaluable suggestions and continual help during the necessary research; to Professor G. F. Papenfuss of the University of California for much assistance in determining specimens and for consenting to read and criticize the original manuscript; to Mr. L. W. Crawley of Auckland University College for translating the descriptions into Latin; and to the Research Fund Committee of the University of New Zealand for the liberal grant made in connection with the writer's researches.

REFERENCES

AGARDH, J. G. 1877. De algis novae zelandiae marinis. *Lunds Univ. Årsskr.,* Afd. 2, 14 (4). 32 pp.

——— 1882. Till algernes systematik. *Lunds Univ. Årsskr.,* Afd. 2, 17. 134+ [2] pp., 3 pls.

DE-TONI, J. B. 1895. *Sylloge Algarum.* Vol. 3. xvi + 638 pp. Patavii.

FELDMANN, J. 1937. Les algues marines de la côte des Albères. I–III. Cyanophycées, Chlorophycées, Phéophycées. *Rev. Algologique* 9 (3–4): 141–335, 67 figs., 10 pls.

HAMEL, G. 1931–1939. *Phéophycées de France.* 1–80+i–xlvii+81–432 pp., 63 figs., 10 pls. Published by the author. Paris.

HARVEY, W. H. 1855. Algae. In: J. D. Hooker, *Flora novae zelandiae.* Vol. II: 211–266, pls. 107–121. Lovell Reeve, London.

HAUCK, F. 1885. *Rabenhorst's Kryptogramen-Flora.* 575 pp., 236 figs., 5 pls. Eduard Kummer, Leipzig.

HOOKER, J. D. 1867. *Handbook of the New Zealand flora.* Part II: 393–798. Reeve and Co., London.

KJELLMAN, F. R. 1891–1893. Phaeophyceae. In: A. Engler und K. Prantl, *Die Natürlichen Pflanzenfamilien, etc.* I (2): 176–290, figs. 129–188. Wilhelm Engelmann, Leipzig.

KUCKUCK, P. 1899. Beiträge zur Kenntnis der Meersalgen. 8. *Compsonema,* ein neues Genus der Phaeosporeen. *Wissensch. Meeresuntersuch.,* N.F., Abt. Helgoland 3 (1): 90–94, 1 pl.

LAING, R. M. 1926. A reference list of New Zealand marine algae. *New Zeal. Inst., Trans.* 57: 126–185.

——— 1929. A reference list of New Zealand marine algae. Supplement 1. *New Zeal. Inst., Trans.* 60: 575–583.

LINDAUER, V. W. 1947. An annotated list of the brown seaweeds, Phaeophyceae, of New Zealand. *Royal Soc. New Zeal., Trans.* 76 (4): 542–566.